PART I

Commentary

Introduction

1. The intention to conduct an annual review of research and development programmes was announced in Cmnd 8591 (Government observations on the report 'Science and Government' by the House of Lords Select Committee on Science and Technology, July 1982) in the following terms:

> 'The Government have .... decided to introduce a system of Annual Reviews of Research. Departments will submit a summary of their research programmes and budgets, to be reviewed inter-departmentally, with independent advice from ACARD, during the early months of the year; this timetable would allow Departments to revise their plans during the next PES cycle in the light of the results of the Review.
>
> ..... Skilful value judgements as to allocation of financial and manpower resources are needed. This will involve distinguishing between vital and dormant areas, identifying gaps, disparities and duplications, and considering the opportunity cost of relinquishing certain areas of research. The emphasis will be on review of long-term plans.'

2. Cmnd 8591 also announced that the staff resources of the Cabinet Office were to be strengthened to enable the review, and other new activities, to be undertaken. This strengthening did not take place until early 1983, and so the review reported here has been conducted over a much shorter timescale than future reviews. In addition, it has had to concentrate upon the assembly of statistical data, since there was no suitable comprehensive source of data on R & D expenditures. This database, an essential foundation for future reviews, is now largely complete and accordingly more effort can in future be devoted to the analysis and interpretation of the data. Part II of this review contains the detailed figures.

3. Much of the point of a centralised survey of R & D expenditure is lost if figures from different sources are calculated on different bases. This requires both a uniform definition of R & D and a consistent basis for assessment of expenditures. The detailed figures presented in Part II are not completely

consistent, but the assumptions underlying each table are shown, and it is hoped that next year's review will show an improvement in this respect.

4. The definition of R & D adopted for the review has been that promulgated by the OECD in the 'Frascati Manual' (The Measurement of Scientific and Technical Activities, OECD, Paris 1980). Its main elements and some illustrative examples are reproduced in Appendix 1. This was chosen because of its wide use, both in the UK and in international bodies. Two significant types of work excluded by this definition are technology transfer and advisory work based on the results of R & D, and research designed to monitor policy initiatives. Both receive substantial funding from Government, and in some cases Departments have included supplementary data in Part II. Although future reviews might well cover such work, it is important that it should be clearly identified as falling outside the Frascati definition, in order to allow for proper comparison to be made between the expenditures of different organisations within the UK, and between UK and other OECD countries.

5. As for the costing assumptions underlying the figures, the intention is to work towards some form of 'full economic costs' for intra-mural expenditures which will allow proper comparison with extra-mural spending. These would include superannuation and other additions to direct salary costs, services provided by the Property Services Agency, HMSO etc and a standard treatment of capital expenditures. Most of the tables in Part II, however, employ 'vote' costs, ie the expenditure falling under public expenditure vote headings for R and D.

6. The current review has covered only the R & D expenditures directly funded by central Government. Future reviews will include the expenditures of the rest of the public sector (notably nationalised industries). They will also set public sector expenditure against information on the R & D activities of the private sector, as revealed by the 1981 'treiennial' survey of R & D expenditure conducted by the Department of Trade and Industry, data from which will be available shortly, and future surveys of a similar nature. (It is likely that DTI will move to a four-yearly cycle of full surveys, with sample surveys at the intervening mid-points.)

The general picture

7. Part II contains details of past and current Government R & D expenditures, and brief statements of each major spending Department's objectives in its R & D programmes. The overall picture is summarised below.

8. The total R & D expenditure of central Government in 1981/82 was about £3.4 billion. Table 1 shows how this was split among the seventeen public expenditure programmes employed in the presentation of central Government expenditure estimates, together with the total expenditure in

those programmes. Figure 1 shows the principal Departmental elements of this expenditure, presented in the way that Sir Ieuan Maddock employed in his 1975 Royal Society lecture on Government R & D expenditure (Proc Roy Soc A Vol 345 pp295-326). The MOD research and development spend includes the cost of the development of specific equipments for defence purposes. There is no procurement activity of similar scale in other Government Departments and so this large development element is identified separately in Figure 1. Some expenditures in the nationalised industries have a somewhat similar nature and will provide a civil counterpart in the future reviews.

9. Figure 2 shows the same elements as Figure 1 (which between them cover £3.3 billion or 97% of the total) expressed as percentages of that £3.3 billion and compared directly with Sir Ieuan Maddock's figures for 1973/4. There may be some inconsistencies, owing to differences in definitions, cost bases etc, but the main changes are clear and are:

(i) a rise in the proportion of expenditure attributable to defence needs;
(ii) a fall in the proportion directed at industrial support, caused principally by the rundown of major expenditure on Concorde and the RB211 aero-engine;
(iii) large relative changes in the three minor expenditure categories, the change in the DHSS figure being in part the result of the transfer of £15 million of 'commissioned' funds back to the Medical Research Council in 1981/2.

10. Trends in the destination of R & D expenditures are illustrated in Figure 3, which shows how some Departments have shifted a proportion of their expenditure away from their own establishments to external contractors, and notably the private sector.

Cabinet Office

Table 1 Central Government Expenditure on Research and Development 1981/82

	Expenditure Programme		R & D	
	Outturn £m	%	Outturn £m	%
Defence	12,606	12.3	1,688.0	49.9
Overseas Aid	960	0.9	18.8	0.6
EC contribution + other aid	726	0.7		
Agriculture Fish, Food and Forestry	1,372	1.3	101.5@	3.0
			4.0	0.1
Industry, Energy, Trade and Employment	5,319	5.2	505.3	14.9
Of Which Dept of Industry	1,988	1.9	275.7	8.1
Energy	688	0.7	215.9	6.4
Trade	237	0.2	2.7	0.1
Employment	2,244	2.2	11.0	0.3
Others	201	0.2		
Transport	3,898	3.8	23.9	0.7
Housing	3,137	3.0	2.4	0.1
Other Environment Services	3,244	3.2	36.9	1.1
Law, Order etc	3,774	3.7	9.3	0.3
Education and Science	11,828	11.5	898.2	26.6
Arts and Libraries	520	0.5	1.3	—
Health and Personal Social Services	12,751	12.4	22.4@	0.7
Social Security	28,510	27.7	0.4	—
Other Public Services	1,556	1.5	10.5*	0.3
Common Services	1,453	1.4		
Scotland	5,772	5.6	40.0	1.2
Wales	2,243	2.2	1.4*	—
Northern Ireland	3,218	3.1	16.4	0.5
TOTAL	102,888	100	3,380.7	100

@ There are other R & D expenditures relevant to these programmes included in the Education and Science total.

* Source DI

Figure 1

Major components of 1981 / 2 Government Research and Development expenditures, by spending department

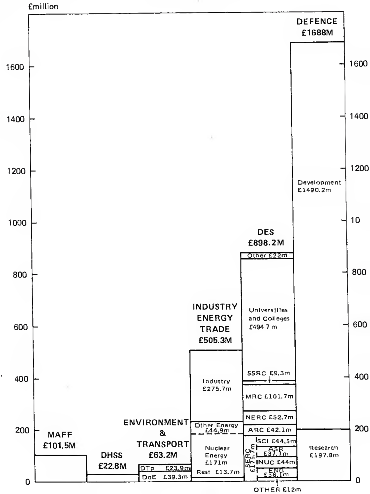


Figure 2

Proportions of Research and Development expenditure attributable to different departments — comparison between 1973/4 and 1981/82

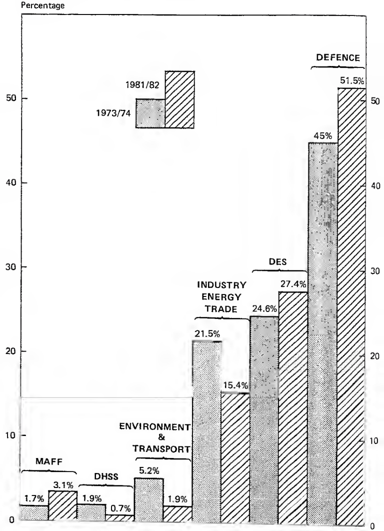
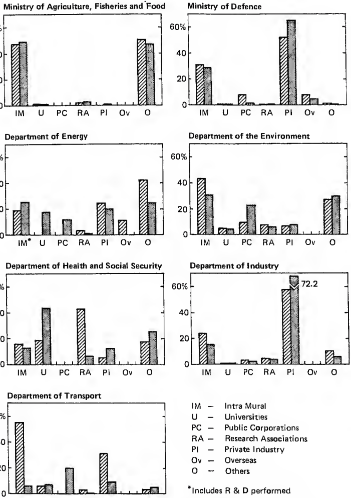


Figure 3
Distribution of selected Research and Development expenditures in 1977/8 and 1981/2
1977/8 ▨ 1981/2 ▩


Ministry of Agriculture, Fisheries and Food

Ministry of Defence

Department of Energy

Department of the Environment

Department of Health and Social Security

Department of Industry

Department of Transport

IM — Intra Mural
U — Universities
PC — Public Corporations
RA — Research Associations
PI — Private Industry
Ov — Overseas
O — Others

*Includes R & D performed in other Government Departments

FRASCATI DEFINITION OF R&D

The following is an extract from 'The Measurement of Scientific and Technical Activities, Frascati Manual 1980', OECD, Paris 1981. It is reproduced by kind permission of the Director of Information for the OECD.

BASIC DEFINITIONS AND CONVENTIONS

2.1 Research and Experimental Development (R&D)

43. Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications.

R&D is a term covering three activities: basic research, applied research and experimental development. *Basic research* is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view. *Applied research* is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. *Experimental development* is systematic work, drawing on existing knowledge gained from research and/or practical experience that is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

2.2 Activities to be excluded from R&D

44. For survey purposes R&D must be distinguished from a wide range of related activities with a scientific and technological base. These other activities are very closely linked to R&D through flows of information and in terms of operations, institutions and personnel, but they should, as far as possible, be excluded when measuring R&D.

45. These activities will be discussed here under three headings:

- Education and training (see 2.2.1);
- Other related scientific and technological activities (see 2.2.2);
- Other industrial activities (see 2.2.3).

The definitions here are practical and designed solely to exclude these activities from R&D. They are thus slightly different from the broader concepts of scientific and technical education and training (STET), scientific and technological services (STS) and 'innovation' discussed in an earlier Chapter.

2.2.1 *Education and Training*

46. All education and training of personnel in the natural sciences, engineering, medicine, agriculture, the social sciences and the humanities in universities and special institutions of higher and post-secondary education. However, bona fide research by post-graduate students carried out at universities should be counted, wherever possible, as a part of R&D.

2.2.2 *Other Related Scientific and Technological Activities*

47. The following activities should be excluded from R&D except where carried out solely or primarily for the purposes of an R&D project (see also examples in section 2.3.1):

2.2.2.1 *Scientific and Technical Information Services*

48. The specialised activities of:

- collecting
- coding
- recording
- classifying
- disseminating
- translating
- analysing
- evaluating

by

- scientific and technical personnel
- bibliographic services
- patent services
- scientific and technical information extension and advisory services
- scientific conferences

except where conducted solely or primarily for the purpose of R&D support (eg the preparation of the original report of R&D findings should be included in R&D).

2.2.2.2 *General Purpose Data Collection*

49. Undertaken generally by government agencies to record natural, biological or social phenomena that are of general public interest or that only the government has the resources to record. Examples are routine topographical mapping, routine geological, hydrological, oceanographic and meteorological surveying, astronomical observations. Data collection conducted

solely or primarily as part of the R&D process is included in R&D (eg data on the paths and characteristics of particles in a nuclear reactor). The same reasoning applies to the processing and interpretation of the data. The social sciences, in particular, are very dependent on the accurate record of facts relating to society in the form of censuses, sample surveys, etc. When these are specially collected or processed for the purpose of scientific research the cost should be attributed to research and should cover the planning, systematising etc of the data. But data collected for other or general purposes, such as quarterly sampling of unemployment, should be excluded even if exploited for research. Market surveys are excluded.

2.2.2.3 *Testing and Standardisatian*

50. Refers to the maintenance of national standards, the calibration of secondary standards and routine testing and analysis of materials, components, products, processes, soils, atmospheres, etc.

2.2.2.4 *Feasibility Studies*

51. Investigation of proposed engineering projects using existing techniques in order to provide additional information before deciding on implementation. In the social sciences, feasibility studies are investigations of the socio-economic characteristics and implications of specific situations (eg a study of the viability of a petro-chemical complex in a certain region). However, feasibility studies on research projects are part of R&D.

2.2.2.5 *Specialised Medical Care*

52. Refers to routine investigation and normal application of specialised medical knowledge. There may, however, be an element of R&D in what is usually called 'advanced medical care', carried out, for example, in university hospitals.

2.2.2.6 *Patent and Licence Work*

53. All administrative and legal work connected with patents and licences. (However, patent work connected *directly* with R&D projects if R&D.)

2.2.2.7 *Policy Related Studies*

54. Policy in this context refers not only to national policy but also to policy at the regional and local levels, as well as that of business enterprise in the pursuit of their economic activity. Policy related studies cover a range of activities such as the analysis and assessment of the existing programmes, policies and operations of government departments and other institutions; the work of units concerned with the continuing analysis and monitoring of external phenomena (eg defence and security analysis); and the work of legislative commissions of inquiry concerned with general government or departmental policy or operations.

2.2.3 *Other Industrial Activities*

55. These can be considered under two, to some extent overlapping, headings:

2.2.3.1 *Industrial Innovation (not elsewhere classified)*

56. All those scientific, technical, commercial and financial steps, other than R&D, necessary for the successful development and marketing of a manufactured product and the commercial use of the processes and equipment.

2.2.3.2 *Production and Related Technical Activities*

57. Industrial production and distribution of goods and services and the various allied technical services in the Business Enterprise sector and in the economy at large, together with allied activities using the disciplines of the social sciences such as market research.

2.3 **The Boundaries of R&D**

2.3.1 *The Basic Criterion*

58. The basic criterion for distinguishing R&D from related activities is the presence in R&D of an appreciable element of novelty. (Supplementary criteria are suggested elsewhere in the Manual). One aspect of this criterion is that a particular project may be R&D if undertaken for one reason but if carried out for another reason will not be considered R&D. This is shown in the following examples:

a. In the field of medicine, routine autopsy on the causes of death is simply the practice of medical care and *not* R&D; special investigation of a particular mortality in order to establish the side effects of certain cancer treatments *is* R&D. Similarly, routine tests such as blood and bacteriological tests carried out for doctors are *not* R&D but a special programme of blood tests in connection with the introduction of a new drug *is* R&D.
b. The keeping of daily records of temperatures or of atmospheric pressure is *not* R&D but the operation of a weather forecasting services or general data collection. The investigation of new methods of measuring temperature *is* R&D, as are the study and development of new systems and techniques for interpreting the data.
c. R&D activities in the mechanical engineering industry often have a close connection with design and drawing work. Usually there are no special R&D departments in small and medium size companies in this industry and R&D problems are mostly dealt with under the general heading 'design and drawing'. If calculations, designs, workshop drawing and operating instructions are made for the setting-up and operating of pilot

plants and prototypes, they should be included in R&D. If they are carried out for the preparation, execution and maintenance of production standardisation (eg jigs, machine tools) or to promote the sale of products (eg offers, leaflets, spare parts catalogues) they should be excluded from R&D.

d. Many social scientists perform work in which they bring established methodologies and facts of the social sciences to bear on a particular problem, but which cannot be classified as research. The following are examples of work which might come in this category and are not R&D: interpretative commentary on the probable economic effects of a change in the tax structure, using existing economic data; forecasting future changes in the patterns of the demand for social services within a given area arising from an altered demographical structure; operations research (OR) as a contribution to decision marking, eg planning the optimal distribution system for a factory; the use of standard techniques in applied psychology to select and classify industrial and military personnel, students, etc and to test children with reading or other disabilities.

End of extract.

The manual then discusses problems at the borderlines between R&D and education and training, other related scientific and technological activities, and other industrial activities. Further chapters cover the classification of institutions involved in R&D, functional classifications, the measurement of personnel and expenditure devoted to R&D, survey procedures, R&D deflaters (used for trend analysis in real terms) and exchange rates (to facilitate international comparisons) and the classification of the socio-economic objectives of Government R&D funding.

The Manual is available through HMSO.

PART II

Objectives and Expenditure of the R&D Programmes of Individual Departments

Introduction

Statements of objectives and tables of expenditure for the research programmes of individual Departments are appended. Where the information was available, two separate tables have been prepared for each Department, covering the five year period 1977/78–1981/2 (and 1982/83 where possible); the first indicates where the research was undertaken, the second the major fields covered. For the Departments of Industry and Energy and the Natural Environment Research Council, additional tables have been prepared to cover expenditure detailed to R&D but falling outside the Frascati definition.

Except where stated, tables show the actual cash expenditure (ie outturn) born on votes having a separately identifiable R&D content. Intra-mural figures include direct wage costs but not (except in the case of the Research Councils) superannuation expenses. The figures are rounded to the nearest £100 thousand: the character ! indicates a figure less than £50,001 but not zero. Columns may not always sum to the totals shown due to rounding errors.

Section 1 covers those Departments currently spending more than about £10 millon per annum.

Secretariat effort has concentrated on those, which account for 99% of Government R&D expenditure, and the data are relatively complete.

Section 2 includes information so far obtained on Departments spending less than £10 million per annum. The data in this section are less complete and where 'source: DOI' appears beneath a table, this indicates that the data have been obtained from that Department's annual PES return to the Department of Industry and have not been separately checked or amplified by the Department directly.

SECTION I

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD (MAFF)

MAFF's R&D has the following general objectives –

i. to advance scientific knowledge relevant to agriculture (including horticulture), fisheries and food in order to increase the efficiency of industry;
ii. to safeguard and improve the quality of food for the community; and
iii. to protect the environment and prevent adverse social effects.

Within these general objectives are more specific aims. In the case of *agriculture* and *food* these are –

i. to maintain and improve the competitive position, efficiency and productivity of the UK agriculture and food industries;
ii. to reduce imports and to increase exports;
iii. to maintain and improve the quality (including nutritional quality) of fresh and processed foods;
iv. to protect the safety of food;
v. to reduce wastage;
vi. to ensure that the producer has available to him appropriate structures, machines, and mechanisation systems and that knowledge is available to use these in the most efficient and effective manner;
vii. to support necessary basic research in support of the other objectives;
viii. to minimise any adverse impact of the agriculture and food industries on the environment;
ix. to protect life and property on both urban and agricultural land against flooding and waterlogging;
x. to protect and improve the health and welfare of farm stock.

Although many of these objectives also apply to *fisheries*, in particular (i)-(vii), there are some others which apply specifically to fisheries, these are –

xi. to conserve the stocks and manage the fishery in respect of those species of fish which are of commercial importance to the UK fishing industry;
xii. to develop new fisheries from presently under-exploited or unexpoloited stocks with commercial potential;
xiii. to avoid danger to humans and reductions in the value of UK landings or reduction in the stocks due to fish disease and parasitic infection;
xiv. to enable the UK Government to negotiate internationally in respect of fish stocks subject to EC agreements with third countries and in

respect of such sensitive subjects as whales and other cetaceans and seals.

With the wide range of sectors to be covered there is no one comprehensive formula by which needs can be measured and priorities established. A balance is maintained between sectors of agriculture, fisheries and food and between these three industries, that balance is changed with changing need and potential. Depending on the circumstances, factors such as gross turnover, added value, capital, labour, land employed, regional and foreign trade implications are of relevance to the determination of R&D options.

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD *Table 1a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural (incl ADAS)	25.0	26.9	31.0	40.1	50.0	
Universities	.2	.3	.5	.3	.4E	
Public Corporations	-	-	-	-	-	
Research Associations	1.0	1.2	1.8	1.9	3.0	
Private Industry	-	-	-	.2	.2E	
Overseas	-	-	-	-	-	
ARC Commissioned	24.7	26.8	30.4	37.4	44.3	
NERC Commissioned	1.2	1.2	1.4	1.7	2.0	
Other Contractors	.5	.6	1.1	1.4	1.6	
TOTAL	52.6	57.0	66.2	83.0	101.5	

E Estimated

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD *Table 1b*

Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Agriculture*	40.5	42.0	46.8	59.6	71.8	
Food Science	1.3	3.3	5.5	6.5	9.6	
Fisheries**	8.7	9.6	10.9	13.1	14.5	
Flood Protection/Drainage	0.6	0.6	0.8	0.8	1.0	
Others	1.5	1.5	2.2	3.0	4.6	
TOTAL	52.6	57.0	66.2	83.0	101.5	

* Further breakdown into 17 sub-categories available
** Similarly, 4 Sub-categories available

MINISTRY OF DEFENCE (MOD)

The R&D programmes of the MOD are aimed at meeting the needs of the Armed Forces for equipment and weapons in a timely and cost effective manner. Within this overall objective the research programme is targeted at providing a basis of technological competence and expertise, both in MOD and UK industry, to enable specific weapon systems and equipments to be developed and produced. The research programme has other subsidiary roles. These include an element of basic innovative research (which is not necessarily of immediate defence application), scientific and technological advice to Ministers, operational assessment studies and statutory requirements such as safety and airworthiness.

Development Programme

The development programme (around 80% of the R&D totals) is carried out almost entirely in industry. New equipment developments recently initiated include–

Harrier GR5 (AV8B) offensive support aircraft
New heavyweight torpedo
Main battle tank improvements (including thermal imaging)
Tracked Rapier (MK I) Army air defence system
New tracker for Sea Wolf shipborne point defence missile system
Satellite communications Skynet IV
Battlefield Artillery Target Engagement System (BATES)
Electronic support measures for submarines.

Two trends are apparent, one technical and one organisational, that will affect development patterns progressively over the years. There is now an increasing emphasis upon weapons systems in development at the expense of weapon carriers (though the latter will need replacement, it will be at longer intervals) and a willingness to forgo the last few per cent of weapon performance where this adds disproportionately to the price. In organisational terms project support work is being progressively devolved where appropriate to industry from the MOD R&D Establishments.

Research Programme

The research programme is divided almost equally between the R&D Establishments and contract work. Most of the latter is in private industry; universities and public corporations share the balance. Research priorities are reviewed regularly to take account of the requirements for future developments and the light of pressures on resources. The most recent trends are for increased emphasis on weapons, sensors, undersea warfare, electronic components and electronic systems.

In view of the problems that often arise in the transition between research and its exploitation, MOD is placing increased emphasis on technology demonstrator programmes in key areas. These are mounted in industry from whom a funding contribution is normally sought.

At the other end of the research spectrum, the R&D Establishments are fostering basic innovative research to provide a wider ranging foundation of expertise for applied research.

The MOD also carries out civil work on repayment terms, the principal element in which is civil aerospace and gas turbine research, funded by DOI.

MINISTRY OF DEFENCE *Table 2a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
INTRA-MURAL	303	330	399	448	502	533
of which Met Office	E4.0	4.5	6.4	6.6	6.7	7.9
Universities	3	3	5	7	7	6
Public Corporations	526	86	14	19	23	33
Private Industry		559	859	1,125	1,166	1,182
Research Associations	1	1	2	2	1	2
Overseas	74	85	77	89	77	122
Research Councils	-	1	-	-	-	-
Others						
Other votes etc	7	10	9	4	5	15
Other Extra-mural	-	1	8	15	1	11
GROSS TOTALS*	915	1,076	1,373	1,709	1,783	1,923
Net Cost to Defence Budget	880	1,028	1,305	1,627	1,688	1,841

E = Original Estimates provision at Estimate prices

* = Total Money dispersed by MOD for Defence R&D before off-setting receipts.

Table excludes civil work (eg for the Department of Trade and Industry and the Civil Aviation Authority) carried out by MOD on repayment terms.

- = Less than half the final digit shown

MINISTRY OF DEFENCE *Table 2b*

Major Fields of Activity £millions at Estimate prices

Broad category of equipment	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Ship construction and underwater warfare	79	81	149	209	298	287
Ordnance and other Army	62	67	92	120	150	164
Military Aircraft	319	332	439	509	498	596
Guided Weapons	98	105	124	183	223	235
Other electronics	107	126	163	231	259	284
Other	158	161	184	227	248	267
TOTAL	823	872	1,151	1,479	1,676	1,833

Meteorological research and development has been excluded from this analysis (it is included in Table 2a)

The *DES's direct support* for research lies primarily in the field of education at all levels, and with curriculum development. In addition to its own programme of sponsored research placed with external agencies such as the National Foundation for Educational Research and university departments of education, which helps to inform the Department's policy and decision making, the Department promotes research activity via the Schools Council and the Further Education Curriculum and Review Unit.

The *DES Science Budget* is one of the main sources of public funds for the support of civil scientific research (the other major source being the grant made to the universities through the University Grants Committee). It is the sum of the annual grants-in-aid paid by the Secretary of State for Education and Science (in exercise of his responsibilities under the Science and Technology Act 1965) to the Agricultural Research Council (ARC), Medical Research Council (MRC), Natural Environment Research Council (NERC), Science and Engineering Research Council (SERC) and the Social Science Research Council (SSRC); and to the British Museum (Natural History) and the Royal Society.

The purpose of the Science Budget is to develop the natural and social sciences, including engineering, to maintain a fundamental capacity for research and scholarship and to support relevant higher education at the post-graduate level. Research ranging from the most fundamental through to work with a practical application is supported. The Research Councils, which are chartered bodies, support these objectives in various ways. They provide for research by making grants to research workers in universities or elsewhere; and they directly operate research establishments. These may be units associated with universities, or central facilities for the use of universities, or separate institutes which carry out research programmes agreed by the Councils. The Councils participate in international scientific programmes where they see this as the most effective way of undertaking research in a particular field. They are responsible for the UK subscriptions to, and participation in the management of, a number of international research centres/facilities (eg the European Organisation for Nuclear Research (CERN), the European Molecular Biology Laboratory and the International Agency for Research on Cancer) which extend UK research capacity. They also support students undertaking post graduate training, and research fellows.

The Secretary of State is advised on his responsibilities for civil science by the Advisory Board for the Research Councils (ABRC). This advice includes recommendations on the distribution of the Science Budget among the various research bodies. The ABRC membership includes representatives of the Government Departments spending substantial sums in commissioned research in support of their departmental objectives with ARC and NERC.

Universities' General Expenditure on R&D

University expenditure on R&D is partly funded from money which reaches the universities from the University Grants Committee (UGC) (funds may come also from Research Councils, Government Commissions, industrial sponsorship and charitable bodies). The UGC allocates resources to universities in the form of block grants covering both research and teaching, within the general principle that university staffs should normally be concerned with both these purposes. In the science fields the intention of the UGC input into research is that it shall provide the basic 'floor' of research capability in university departments which is necessary if speculative ideas are to be generated and developed to the stage where they may attract support from external sponsors (the combination of these two types of money constitutes the 'dual support system'). Since universities' research activities and expenditure cannot be clearly distinguished, and thus the UGC's objectives in funding that expenditure cannot be clearly distinguished from its wider objectives in funding the university system, the assignment of resources to research for the purposes of this review is based on a notional attribution of universities' departmental and central expenditure between research and teaching. The UGC have estimated that, over the six years from 1977/78 to 1982/83, the contributions to Research and Development at universities from the funds which they allocate have been £261.7m, £298.4m, £359.2m, £441.3m, £494.7m and £563m respectively.

DEPARTMENT OF EDUCATION AND SCIENCE *Table 3a*
(Other than Science Budget and UGC)

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural	-	-	-	-	-	-
Universities	0.7	0.7	0.9	1.0	2.5	2.1
Public Corporations	-	-	-	!	-	-
Research Associations	0.3	0.7	0.6	0.5	1.0	1.3
Private Industry	-	-	-	-	-	-
Overseas	0.1	0.1	!	!	0.1	0.1
Others	2.4	1.7	1.7	2.2	5.2	5.5
NET TOTALS	3.5	2.9	3.3	3.8	8.8	9.0

DEPARTMENT OF EDUCATION AND SCIENCE *Table 3b*
(Other than Science Budget and UGC)
Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82 E	1982/83
Education Research General	1.1	1.1	2.1	3.2	6.6	7.3
Council for Educational Technology	0.3	0.2	0.4	0.4	0.5	
National Foundation for Educational Research	!	!	!	!	I	
Other	0.6	-	-	-	-	
Schools Council	1.0	1.1	1.3	1.4	1.7	1.6
OECD (Centre for Educational Research & Innovation)	!	0.1	0.1	0.1	0.1	0.1
HQ Staff	0.1	!	0.1	0.1	0.1	0.1
Gross Total	3.1	2.5+	4.0	5.1	8.9	9.1
NET TOTAL*	3.5	2.9	3.3	3.8	8.8	9.0

* As quoted in the R&D Survey submitted to the Dept of Industry
+ Total does not agree due to rounding
E Estimated

DEPARTMENT OF EDUCATION AND SCIENCE *Table 3c*
Science Budget (1) and R&D at Universities £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
ARC	20.4	23.8	28.8	35.0	42.1	43.9
MRC (2)	42.3	44.3	54.4	71.8	101.7	104.4
NERC	27.7	29.9	35.1	45.0	52.7	57.6
SERC	111.9	125.4	146.0	164.8	175.7	191.8
SSRC	4.4	5.0	6.1	8.8	9.3	9.8
NHM (3) (4)	4.2	4.3	5.3	6.7	9.0	9.5
Royal Society	2.2	2.4	2.9	3.7	4.2	4.5
UGC (5)	261.7	298.4	359.2	441.3	474.0	563.0
TOTAL (2) (4)	474.8	533.5	637.8	777.1	889.4	984.5

(1) The figures shown above for the ARC, MRC, NERC, the Natural History Museum and the Royal Society are consistent (allowing for roundings to £0.1m) with those which appeared in the main Supply Estimates of the year in question: provision may have been amended later via Revised or Supplementary Estimates. Source: 'The Science Budget, A Forward Look 1982, ABRC. Figures for SERC and SSRC are taken from tables 7b and 8b respectively.

(2) MRC and total figures for 1981-82 onwards include funds transferred from Health Departments in respect of commissioned bio-medical research.

(3) NHM figures fòr 1976-77, 1981-82 and 1982-83 include the cost of major building items borne on DOE (PSA) Vote.

(4) NHM and total figures to not include other PSA expenditure on behalf of the Museum.

(5) UGC estimated out turn.

AGRICULTURE RESEARCH COUNCIL (ARC)

The ARC has as its primary aims the advancement of scientific knowledge relevant to agriculture, horticulture and food and the application of this knowledge to increase the efficiency of related industries, without injury to the environment and with due regard to the welfare of farm animals; also to safeguard and improve the marketability and quality of food.

The ARC draws approximately half its funds from the Science Budget; a similar sum comes from research commissioned by the Ministry of Agriculture, Fisheries and Food, with about five per cent coming from other sources including industry.

The ARC advises the Department of Agriculture and Fisheries for Scotland on matters concerning the seven grant-aided agricultural research institutes in Scotland which are financed by the Department and which, together with ARC directly-funded institutes and the institutes it grant aids, form the Agricultural Research Service.

AGRICULTURAL RESEARCH COUNCIL *Table 4a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
ARC Institutions						
Recurrent	13.8	15.1	17.3	21.3	24.5	26.5
Capital	1.7	2.4	2.3	3.7	4.4	5.3
Universities	1.8	1.8	2.2	3.0	3.7	4.4
Grant-aided Institutes:						
Recurrent	24.7	27.3	32.0	39.0	44.0	44.5
Capital	3.5	3.7	4.9	5.3	7.2	7.5
General Expenses	2.7	3.2	4.4	6.2	6.4	8.6
HQ Land & Buildings	n/a	n/a	n/a	0.1	!	0.1
Balance C/F	n/a	n/a	n/a	!	0.2	0.1
GROSS TOTAL	n/a	n/a	n/a	78.5	90.4	97.1

n/a–Not Available

AGRICULTURAL RESEARCH COUNCIL *Table 4b*

Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Animals	16.0	18.3	20.8	24.7	28.5	
Plants and Soil	19.4	22.6	25.1	31.0	34.8	
Food	3.4	4.1	4.4	6.4	7.7	
Other	2.9	3.4	3.6	4.2	5.6	
ARC HQ*	2.1	2.9	3.2	5.6	5.7	
TOTAL	43.9	51.3	57.8	71.9	82.4	

* Includes a contribution by MAFF to ARC HQ and Central Administration Costs

MEDICAL RESEARCH COUNCIL (MRC)

The primary objective of the MRC is to advance knowledge that will improve the health of individuals in the community; this objective includes social, environmental, and preventive medicine, as well as the treatment of the sick. To achieve this objective, the Council identifies and encourages studies in developing fields and in new areas to promote a balanced advance of knowledge from fundamental research to the solution of practical problems in medicine and public health.

The Science Vote provides the MRC with the largest single source of funds for biomedical research in the UK. Where the problems of research require investigations overseas, these are funded in collaboration with the Overseas Development Administration. The MRC has a special relationship with the Health Departments in providing advice on medical problems, in undertaking research at the request of the Departments, and in sponsoring a programme of health services research.

MEDICAL RESEARCH COUNCIL *Table 5a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural (MRC Establishments and scientific staff)						
(i) UK	28.9	32.9	37.8	48.1	56.3	
(ii) Overseas	1.0	1.2	1.4	1.6	2.3	
SUB TOTAL	29.8	34.1	39.2	49.7	58.6	
Universities and Polytechnics						
i) Grants	12.7	14.1	18.4	25.3	28.9	
ii) Training awards & Fellowships *	3.4	3.9	4.5	5.2	5.7	
SUB TOTAL	16.1	18.0	22.8	30.5	34.6	
Other Bodies** – grants	2.7	2.4	3.0	4.0	3.5	
Overseas	1.3	1.4	1.5	1.4	1.5	
Others						
i) administration	2.4	2.6	3.2	4.2	4.8	
ii) central expenses	0.6	0.7	0.8	1.0	1.2	
iii) new building	1.4	2.6	3.1	2.1	2.2	
TOTAL EXPENDITURE ***	54.4	61.8	73.7	92.9	106.5	

* Some training is provided in MRC's own establishments, although where registration for a degree is involved, this will be with a university or polytechnic.

** Mainly non-teaching hospitals.

*** Commissioned research funds (Cmnd 5046) for each of the years in question are included in these totals and are as follows:

77/8	£10.5m
78/9	£12.2m
79/80	£12.7m
80/1	£15.4m
81/2	£0.6m

MEDICAL RESEARCH COUNCIL *Table 5b*

Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Neurosciences	8.3	9.2	11.3	15.9	17.9	
Anaesthetic Agents	0.3	0.3	0.4	0.5	0.5	
Ageing	0.2	0.2	0.3	0.4	0.4	
Molecular and Cell Biology, Immunology	6.7	7.4	8.8	12.2	14.6	
Skin	0.3	0.4	0.5	0.5	0.6	
Reproduction and Development	4.9	5.2	6.5	9.5	11.2	
Cancer	5.9	6.2	7.3	9.7	10.5	
Blood and Cardiovascular System	1.8	2.2	3.1	4.0	4.1	
Respiratory System	0.5	0.6	0.7	0.6	0.9	
Environment	3.5	3.8	4.7	5.9	6.3	
Services & Techniques	4.1	4.2	6.1	7.0	8.4	
Gastrointestinal Tract	0.7	0.7	1.1	1.5	1.6	
Kidneys and urinary tract	0.5	0.4	0.6	0.6	0.7	
Teeth and associated tissues	0.5	0.6	0.6	0.6	0.8	
Endocrine Glands	0.4	0.5	0.6	0.8	1.1	
Muscle, bone & joints	1.8	2.2	2.5	3.1	3.6	
Infections (other than tropical)	3.7	3.9	4.0	4.9	5.0	
Nutrition	1.0	1.1	1.4	1.7	1.9	
Organisation of medical care	0.4	0.4	0.5	0.5	0.6	
Tropical medicine	2.8	3.0	4.1	5.1	6.2	
TOTAL*	48.4	52.7	65.2	85.2	96.8	

* exclusive of expenditure on studentships, international subscriptions expenditure on new buildings.

NATURAL ENVIRONMENT RESEARCH COUNCIL (NERC)

The NERC is responsible for encouraging, planning and executing research in those sciences, physical and biological, that relate to man's natural environment and its resources. Such investigations seek to provide a better understanding not only of the nature and processes of the environment in which we live and on whose resources we depend, but also of their influence on man's activities and welfare and, of growing importance today, of man's influence on them.

The fields of research may be broadly defined as: The Solid Earth–its physical properties and mineral resources (geology, geophysics and geochemistry); The seas–their characteristics and living and mineral resources (physical oceanography and marine ecology); Inland Waters–their characteristics and living resources (hydrology and freshwater ecology); The Terrestrial Environment–the structure, interactions and productivity of plant and animal populations and communities (terrestrial ecology and soil science); Atmosphere– its structure and interactions; and Interdisciplinary Studies of the Physical and Biological Properties of the Antarctic Environment (atmospheric, earth and life sciences).

It is the Council's intention to maintain and, if possible, to increase its level of support for universities. Currently, and in the foreseable future, the NERC is paying particular attention to the potential of remote sensing in its application to the environmental sciences, developing research programmes on a collaborative basis involving other Research Councils, the universities and industry.

NATURAL ENVIRONMENT RESEARCH COUNCIL *Table 6a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
1. Component Institutes*	31.4	32.5	39.2	51.2	58.3	58.2
2. Grant Aided Labs and Units	3.1	3.9	4.2	4.9	5.6	5.1
3. Universities and Post Graduates	2.7	2.8	3.4	4.2	4.5	4.8
4. Research Vessel Services*	3.8	4.5	4.4	5.3	6.7	5.4
5. Other Research	0.8	0.8	0.5	0.7	0.9	2.0
6. Administration/HQ	1.7	1.8	1.8	1.8	2.0	2.2
7. Central Expenses	0.6	0.9	1.1	1.8	2.4	2.6
TOTAL	44.2	47.2	54.6	69.9	80.4	80.3

excluded from the above figures (outside Frascati definitions):-

1. IGS Museum	0.5	0.5	0.6	0.7	0.8	1.0
3. Studentships	2.4	2.7	3.3	3.9	4.4	4.8
6. University Support Admin Costs	!	!	0.1	0.1	0.1	0.2
6. Information Services	-	-	0.2	0.3	0.4	0.4
6. Relocation Costs	-	1.0	-	-	-	-
7. Relocation Costs	1.0	0.1	-	-	-	-
TOTAL EXCLUDED	4.0	4.3	4.1	5.0	5.8	6.3

* A substantial proportion of this expenditure is used to provide facilities and central services to support university research.

NATURAL ENVIRONMENT RESEARCH COULCIL *Table 6b*

Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
The Solid Earth	23.2	22.5	28.0	34.5	42.4	
The Seas	10.4	12.3	13.3	18.5	20.7	
Inland Waters	4.4	5.2	5.5	6.6	7.0	
Terrestrial environment	4.5	5.7	6.1	8.0	7.8	
The Atmosphere	1.6	1.5	1.7	2.2	2.4	
TOTAL	44.2	47.2	54.6	69.9	80.4	

SCIENCE AND ENGINEERING RESEARCH COUNCIL (SERC)

The SERC's objectives are widely drawn, and *inter alia* empower the Council to encourage and support research and development in science and technology. In practice its prime objective has been to maintain the standard of research and postgraduate education in science and engineering in the universities and polytechnics. The phrase 'science and engineering' is interpreted to embrace all the natural and applied sciences which fall outside the remit of ARC, MRC and NERC. Thus the SERC is responsible for engineering, physics and astronomy, chemistry, mathematics and those parts of biology which are not otherwise supported.

In engineering and applied science, SERC's policy is to encourage close collaboration between the academic and industrial worlds, and to direct support into those areas which underpin the long-term prosperity of British Industry.

SCIENCE AND ENGINEERING RESEARCH COUNCIL *Table 7a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Universities						
Research Grants	26.4	30.9	43.5	56.5	62.8	68.4
Post Graduate Awards*	19.1	22.8	24.1	29.8	33.0	34.6
SERC Establishments	40.6	46.0	56.9	64.6	70.3	78.4
Outside Research and Other Domestic Facilities	3.2	3.2	2.6	2.2	1.8	1.7
International Contributions	41.7	45.3	43.1	41.5	40.8	43.3
Administration*	5.8	6.1	5.4	6.8	8.0	8.4
TOTAL	136.8	153.3	175.5	201.4	216.7	234.8

* Considered not within Frascati

SCIENCE AND ENGINEERING RESEARCH COUNCIL *Table 7b*

Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
SCIENCE BOARD						
Biological Sciences	2.7	2.9	4.7	6.8	6.8	6.3
Chemistry	3.1	4.2	6.0	8.2	7.0	7.5
Mathematics	0.4	0.4	0.4	0.7	0.7	0.8
Physics	2.0	2.2	2.4	5.9	4.2	4.1
Other	0.1	0.2	0.6	0.9	0.8	1.8
Establishments & Other Domestic Facilities	6.5	10.8	14.4	17.3	17.8	20.6
International Contributions	5.8	6.7	7.5	8.3	7.2	6.1
TOTAL SCIENCE	20.7	27.4	36.1	48.1	44.5	47.2
ASTRONOMY SPACE AND RADIO (ASR) BOARD						
Solar System	1.1	0.9	1.6	2.1	2.1	2.0
Astronomy	3.1	4.5	4.6	4.7	4.8	4.6
Establishments & Other Domestic Facilities	12.6	13.2	15.1	17.7	20.7	22.5
International Contributions	11.0	9.7	9.0	9.4	9.6	9.7
TOTAL ASR	27.8	28.4	30.4	33.9	37.1	38.9
NUCLEAR PHYSICS BOARD						
Nuclear Structure	1.2	1.3	1.4	1.5	2.2	2.4
Particle Physics	1.7	2.0	2.1	2.2	3.2	3.5
Establishments & Other Domestic Facilities	16.1	16.1	17.5	16.2	16.1	17.5
International Contributions	23.8	27.7	25.2	22.4	22.5	26.6
TOTAL NUCLEAR PHYSICS	42.8	47.1	46.3	42.3	44.0	49.9
ENGINEERING BOARD						
Environment	1.3	1.1	1.5	1.6	2.2	2.5
Engineering Processes	1.7	1.7	2.6	2.5	3.5	3.6
Machines and Power	2.0	2.0	2.7	3.3	4.2	4.7
Materials	2.2	1.9	3.9	3.9	4.4	4.7
Information Eng	2.6	2.5	4.0	4.4	6.1	8.8
Special Programmes						
Teaching Company	0.2	0.4	0.5	1.2	1.3	2.0
Marine Technology	0.4	1.2	2.8	4.0	5.4	5.2
Polymer Engineering	0.2	0.4	0.7	1.3	1.6	1.5
Energy	-	-	-	-	-	0.6
Biotechnology	-	-	-	-	-	0.8
Other	0.1	0.6	0.4	0.1	0.1	0.1
Establishments & Other Domestic Facilities	3.6	4.3	4.9	8.0	9.3	6.7
TOTAL ENGINEERING	14.2	16.1	24.1	30.3	38.1	41.3
OTHER SUPPORT	6.4	6.4	9.2	10.1	12.0	14.5
TOTAL	111.9	125.4	146.0	164.8	175.7	191.8

SOCIAL SCIENCE RESEARCH COUNCIL (SSRC)

The objectives of the SSRC are to encourage and support research in the social sciences. In the past a high degree of priority was given to the training of research workers, in the fields of economics, economic and social statistics, education, management and industrial relations, political science (including international relations), psychology, social anthropology, sociology and social administration, economic history, economic and human geography, criminology, health economics and social aspects of new technologies.

In recent years there has been greater emphasis on multi-disciplinary research in the social sciences and increased concern with policy problems. In certain cases this is achieved through establishing units and centres, dealing with such matters as race relations, industrial relations, health economics and the family. SSRC occasionally commissions work on behalf of Departments (eg DHSS, DOI) and provides support for some ventures on the basis of shared funding (eg The Technical Change Centre).

SOCIAL SCIENCE RESEARCH COUNCIL *Table 8a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intramural (Research Units)	0.6	0.6	0.7	0.1	1.1	1.2
Universities and Polytechnics*	3.8	4.4	5.4	7.8	8.2	8.6
Public Corporations	$	$	$	$	$	$
Research Associations	$	$	$	$	$	$
Private Industry	$	$	$	$	$	$
Other	$	$	$	$	$	$
TOTAL	4.4	5.0	6.1	8.8	9.3	9.8

* includes payments for research at other bodies
$ not separately available

Table 8b

Major Fields of Activity

£millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Computing and the Social Sciences	0.1	0.1	0.2	0.2	0.2	0.1
Economic and Social History	0.3	0.4	0.4	0.8	1.0	1.1
Economics	0.8	1.0	1.0	1.6	1.8	2.0
Education	0.3	0.5	0.6	0.9	0.7	0.6
Human Geography and Planning	0.2	0.3	0.3	0.7	0.7	0.7
Law & Social Sciences	0.2	0.2	0.3	0.4	0.4	0.5
Linguistics	0.1	0.1	0.2	0.2	0.2	0.1
Management and Industrial Relations	0.6	0.6	0.8	0.9	0.7	0.8
Political Science & International Relations	0.2	0.2	0.4	0.5	0.5	0.6
Psychology	1.0	0.7	1.0	1.2	1.2	1.2
Social Antropology	0.1	0.1	0.1	0.2	0.3	0.4
Sociology and Social Administration	0.4	0.5	0.7	1.1	1.2	1.3
Statistics	0.2	0.3	0.3	0.2	0.2	0.3
Transport	-	-	-	-	0.2	0.2
TOTAL	4.4	5.1	6.1	8.1	9.3	9.8

DEPARTMENT OF ENERGY (DEn)

The DEn Non-Nuclear R&D programme can be split into two main components, which are (i) offshore work and (ii) renewable energy and energy utilisation.

Offshore work involves about half the expenditure in the programme. The principal objectives for this effort are: to improve the safety of offshore operation; to improve our knowledge of the continental shelf for licensing purposes; and to support the UK offshore industry.

The major part of the work on renewable energy and energy utilisation is devoted to renewables, with the objective of identifying by the mid-1980s the potential economic contribution renewables could make to the future UK energy supplies. Priority is being given to R&D on the economically and technically more promising areas of wind power and geothermal energy. In addition there is a certain amount of work designed to improve coal technology including the UK involvement in the Internal Energy Agency project on fluidised bed combustion at Grimethorpe. The remaining component of the programme is a growing effort on energy conservation R&D.

DEPARTMENT OF ENERGY *Table 9a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83 E
Intra-Mural	0	0	0	0	0	0
Universities	!	0.5	0.5	2.5	7.9	4.9
Public Corporations	-	0.9	2.3	3.0	4.8	4.0
Research Associations	0.6	0.8	1.1	0.7	0.6	1.0
Private Industry	4.3	3.8	8.8	8.8	9.0	8.4
Overseas	1.9	0.3	0.2	!	!	0.1
Other Government Depts	3.4	3.6	5.4	8.8	11.5	10.7
Others (includes Research Councils)	7.4	7.0	9.0	8.9	11.0	8.1
NET TOTAL NON-NUCLEAR	17.8	16.1	27.4	32.7	44.9	37.4
NET TOTAL NUCLEAR (UKAEA)	107.7	118.6	129.6	159.2	171.8	176.1
TOTAL	125.5	134.6	156.9	191.8	215.9	213.4

E Estimated
Nuclear Figures From UKAEA PES Returns to DI
Non-Frascati expenditure shown in Table 9c is not included in the above

DEPARTMENT OF ENERGY

Major Fields of Activity

Table 9b

£millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
OFFSHORE TECHNOLOGY						
Industrial support	2.1	2.3	3.9	2.3	3.0	1.9
Underwater initiative	-	-	0.2	1.0	0.8	0.7
Safety	3.8	2.7	2.7	2.6	3.2	2.7
Enhanced Oil Recovery	-	!	0.4	1.2	2.7	2.7
Reservoir Simulation	0.3	0.9	0.9	0.9	1.0	1.1
Survey of UKCS	6.7	5.0	6.7	6.0	10.1	7.9
Oceanographic Services	0.5	0.7	0.9	1.2		
Deep drilling	-	-	-	1.9		
MATSU services	0.4	0.5	1.0	1.2	1.0	1.0
SUB TOTAL	13.9	12.1	16.7	18.3	21.7	18.0
RENEWABLES						
Wind	1.2	0.1	0.4	0.8	0.8	13.2
Wave		1.8	3.0	3.3	4.4	
Geothermal		0.2	1.3	2.3	8.1	
Solar		0.1	1.1	0.7	1.0	
Biomass		-	0.1	0.2		
Tidal		0.1	0.6	1.4	0.3	
Misc & Coal liquefaction		1	0.3	0.5	!	
Energy Utilisation		0.2	0.2	0.3	0.5	
ETSU services	1.0	1.3	1.7	2.8	3.5	3.1
SUB TOTAL	2.2	3.9	8.7	12.4	18.7	16.3
INTERNATIONAL ENERGY AGENCY	1.9	1.1	2.3	2.4	4.7	3.4
OTHER (not financed through Chief Scientist's budget)	-	!	!	!	-	-
GROSS TOTAL	18.0	17.1	27.8	33.1	45.2	37.7
APPROPRIATIONS-IN-AID	–0.2	–1.0	–0.4	–0.5	–0.2	–0.3
NET (NON-NUCLEAR) TOTAL	17.8	16.1	27.4	32.7	44.9	37.4
UKAEA	107.7	118.6	129.6	159.2	171.0	176.1

MATSU: Marine Technology Support Unit　　ETSU: Energy Technology Support Unit
E Estimates　　Nuclear figures from UKAEA returns to DTI PES survey

DEPARTMENT OF ENERGY

Analysis of Expenditure on Non-Frascati Work

Table 9c

£millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Information Services	0.2	0.1	0.2	0.2	0.4	0.2
Policy related work	0.1	0.1	0.2	0.3	0.4	0.3
Patents (offshore)	!	!	!	1	!	1
Patents (renewables)	!	1	!	!	0.1	!
TOTAL	0.3	0.2	0.4	0.6	0.9	0.7

DEPARTMENT OF THE ENVIRONMENT (DOE)

The DOE research programme covers a range of functions which affect people's living environment both natural and man-made. Environmental protection research is undertaken to assist in the following objectives: to protect human life and to safeguard plants, animals, eco-systems and other environmental resources of use to man; to minimise permanent adverse affects on and to improve the natural or man-made environment. Current topics are lead pollution, acid rain, hazardous wastes, oil pollution and noise. A major subject relates to the nuclear industry for which the options for treatment, storage and disposal of radioactive waste are being identified and assessed. Research on water includes studies on water quality as affected by sewerage, inland and estuarine water, coastal protection and the stability of dams and embankments.

Planning responsibilities including those involved with development plans and strategic planning, require a wide range of research activity, eg. to provide a basis for minerals planning and information on land use, inner cities and the viability of rural communities. Housing research includes work to determine trends, conditions of the housing stock and the effectiveness of public sector policies; the emphasis of work on house-building practice is on defects and the implications of energy conservation measures.

The building and construction research and development programme is designed to underpin the DOE's responsibility for building control and sponsorship of the industry and to meet the needs of the Property Services Agency which is responsible for the procurement, design and maintenance of government buildings. The work covers design, construction and maintenance of buildings with respect to quality, management, materials science and the varying performance requirements such as fire and structural performance.

DEPARTMENT OF THE ENVIRONMENT *Table 10a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79 **	1979/80 **	1980/81	1981/82 F	1982/83
Intra-mural $ Gross	13.4	14.6	14.2	17.3	15.8	
(Net)	(N/A)	(10.7)	(10.6)	(12.8)	(12.0)	
Universities+	1.7	2.3	2.6	2.3	1.7	
Public Corporations*	3.0	7.6	7.4	9.8	8.8	
Research Associations	2.4	2.9	2.7	2.9	2.3	
Private Industry @	2.0	2.4	1.9	4.4	3.0	
Overseas	N/S/A	N/S/A	N/S/A	N/S/A	N/S/A	
Research Councils	5.0	6.3	5.9	8.1	8.2	
Other Government Depts	2.5	3.0	2.5	2.5	3.4	
Others	0.8	1.9	1.4	-	-	
TOTAL	30.9	37.1	34.9	42.9	39.3	

* UKAEA + local authorities + water authorities etc.

@ Industry (including NBFL) + consultants

** September 1979 prices; + and Polytechnics

F - R&D within Frascati definitions.

$ Includes the building and HQ costs in Table 10b

DEPARTMENT OF THE ENVIRONMENT *Table 10b*

Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Planning, Countryside and Local Government =	4.4G	5.9G	5.7G	5.8	4.9	
Housing	1.1G	1.6G	1.7G	2.0	2.4	
Building and Construction*	6.9G	8.5G	7.7G	10.5	8.8	
Environmental Protection	8.1G	9.0G	7.5G	8.5	4.8	
Water Quality					4.3	
Radioactive Waste		3.9G	5.1G	9.8	9.0	
Special Programmes	6.6G	8.4G	7.2G	-	-	
HQ Staff Concerned with Research	1.5T	1.5	1.6	1.6	1.5@	
Grants to Other Organisations	1.3	1.7	1.3	3.9	3.4	
New Building and Major Works Services	0.9	0.3	0.5	1.0	0.2	
Receipts	N/A	3.8	3.7	4.4+	3.5+	
NET TOTAL	30.9$	36.9	34.7	42.9	39.3	

G Gross Figures; = Planning, Countryside & Resources before 1980/81
@ Estimated, and includes service costs (eg personnel, legal)
+ Figures already taken into account in subject areas
T Includes DTp DGR costs; $ Gross total
* Building only in 1977/78; F R&D within Frascati definitions

DEPARTMENT OF HEALTH AND SOCIAL SECURITY (DHSS)

DHSS commissions research in four main fields –

health, personal social services and social security;
National Health Service (NHS) buildings and engineering;
NHS equipment and supplies;
NHS scientific and clinical computer R&D.

About 60 per cent of DHSS funding goes on research in the first of these areas and is based mainly in universities and polytechnics. Its detailed objectives are those set by priority requirements of a wide range of customer interests throughout the Department and the Welsh Office.

The other programmes contain a significant element of development and their objectives are closely related to the needs of NHS.

There are close links with the Medical Research Council which funds biomedical and health services research and with the Social Science Research Council, especially on research in child care and health economics.

DEPARTMENT OF HEALTH AND SOCIAL SECURITY *Table 11a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural	3.6	2.0	2.4	2.6	2.9	2.0
Universities	4.3	4.4	5.7	6.8	9.8	9.7
Public Corporations	!	!	!	!	!	!
Research Associations and Research Councils	9.8	11.9	13.0	15.6	1.4	1.5
Private Industry	1.2	1.9	2.4	2.5	2.7	2.3
Overseas	-	-	-	-	-	-
Others	4.0	3.8	3.6	4.4	5.6	5.1
TOTAL	22.9	24.0	27.1	32.0	22.5	21.7

* Estimated Outturn

DEPARTMENT OF HEALTH AND SOCIAL SECURITY *Table 11b*

Major Fields of Activity (other than MRC expenditure) £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83 E
Health and Personal Social Services Research and Development	7.5	8.1	10.2	13.9	13.9	12.6
NHS Building and Engineering	0.7	1.2	1.5	2.0	1.9	1.9
NHS Equipment, Appliances and Supplies	1.5	1.9	2.6	3.4	3.5	3.2
NHS Computer R&D	2.1	1.8	1.2	1.3	2.2	2.7
MRC	8.9	10.7	11.4	13.8	-	-
Bioengineering	0.2	0.2	0.2	0.5	0.9	1.2
Others (Hospital clinical research subsequently devolved to the NHS)	2.0	-	-	-	-	-
TOTAL	22.9	24.0	27.1	32.0	22.4	21.7

E - Estimated Outturn

HOME OFFICE

The Home Office funds research in its Research and Planning Unit, Radio Regulatory Department and the technical services branches of the Police Divisions.

The objectives of the Research and Planning Unit relate directly to the policy areas to which its work relates, ie criminal justice, criminal policy, police prisons, commuity programmes and immigration.

The Directorate of Radio Technology, part of the Radio Regulatory Department, is responsible for the technical aspects of the management of the radio spectrum. The work is limited largely to experimental development, although some projects involve an element of applied research, and is mainly undertaken in-house. Much of the work is concerned with forward planning for radio services at a time when the technology is changing at an increasing rate. The demands of the radio frequency spectrum are such as to require the use of the latest technology in deriving planning standards. A good deal of the work is international in character, the research activities of the Directorate providing a part of the necessary basis for the establishment of the United Kingdom's position in international negotiations on the use of radio frequency spectrum, on the limits of radiation and methods of measurement, and on a wide range of international standards. The results of the Directorate's research activities are used also in their work within the United Kingdom to accommodate the wide range of radio systems users involving Government Departments, nationalised industries, broadcasting authorities and private industry.

The objectives of the R&D work of the technical services branches of the Police Divisions are to help the police and fire services assess and improve their effectiveness through the utilisation of modern technology and methods; to help the Prison Department in the improvement of prison security systems and the evaluation of their cost effectiveness; to provide advice on the effects of nuclear and conventional weapons and the protection of the civilian population against such effects, including post-attack recovery; and to develop and improve methods of forensic examination and analysis.

HOME OFFICE

Table 12a

Analysis of Sector Carrying out the Work

£millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural	3.2	3.6	4.5	5.6	5.3	
Universities	0.3	0.2	0.3	0.4	0.5	
Public Corporations	!	0.1	-	!	!	
Research Associations	-	!	!	0.2	0.2	
Private Industry	1.3	1.7	1.6	2.0	2.7	
Overseas	-	-	-	-	!	
Others						
Other Government Depts	0.4	0.2	0.3	0.3	0.2	
Others	0.1	0.1	0.1	0.1	0.4	
TOTAL	5.3	5.9	6.1	8.7	9.3	

Figures Include Estimated Average (HQ) Staff Costs

HOME OFFICE *Table 12b*

Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
TECHNICAL SERVICES						
Forensic Science	0.5	0.6	0.7	0.9	0.9	
Telecommunications for Protective Services	0.6	0.7	0.8	1.3	1.1	
Equipment etc for Protective Services	2.9	3.0	3.4	4.3	3.8	
Fire Service	0.4	0.5	0.5	0.6	0.5	
Prison Security Systems	0.1	0.1	0.1	0.2	0.2	
RESEARCH & PLANNING UNIT						
Law Services and Race Relations	0.9	1.0	1.2	1.5	2.1	
RADIO REGULATORY DEPARTMENT						
Radio Technology	N/A	N/A	N/A	N/A	0.3	
TOTAL	N/A	N/A	N/A	N/A	9.3	

Figures include Estimated Average (HQ) Staff Costs

DEPARTMENT OF INDUSTRY (DOI)

DOI has a special role to play in providing the necessary infrastructure of technical services and in giving limited amounts of money on a selective basis to help companies to innovate successfully.

DOI's expenditure on R&D has increased in real terms in recent years and was 27 per cent higher in 1982/83 than in 1978/79. It is budgeted to rise by a further 10 per cent in 1983/84, again in real terms. Much of the increase has been for innovative projects in industry. DOI currently influences about one-seventh of all industrial R&D because of the gearing effect of 25 and 33 1/3 per cent grants. There has also been an increase in advisory services which enable industry to make good use of the knowledge and expertise available within the UK. These are particularly valuable for small firms who usually lack the technological resources of big companies.

DOI seeks to ensure that the scale and nature of *research* effort and inward technology transfer are geared to UK industrial needs. Most of the world's R&D is carried out overseas, and British firms need to be aware of these developments and to make the most of the opportunities they offer. The Department's network of science counsellors, assisted by British Council staff, help to provide this information.

DOI also wishes to promote the development of *standards* in order to raise the design and quality aspects of UK competitiveness to international levels. R&D is supported, mainly at the Industrial Research Establishments, and a recent initiative in conjunction with the Department of Trade seeks to improve Quality Assurance in British companies by means of funded consultancies.

Some of the DOI's most useful work has been in spreading *awareness* and encouraging the adoption of key technologies to maintain industrial competitiveness. These can be of particular value to traditional industries, and the Industrial Research Associations play an important role in informing and helping their members. DOI has produced leaflets describing a number of successful microelectronics applications assisted under the Microelectronics Applications Programme (MAP).

Finally, the DOI seeks to use public purchasing in a systematic way in order to promote innovation and meet international standards. The DOI is not itself a major purchaser but it has sponsored some 20 'offices of the future' in order both to assist the manufacturers to make their products more widely known and to make users more familiar with the new technology.

DEPARTMENT OF INDUSTRY *Table 13a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural	32.6	30.8	33.5	40.6	43.8	
Universities	0.8	1.1	1.4	2.1	2.0	
Public Corporations*	4.7	4.8	5.4	4.9	5.7	
Research Associations	6.2	8.1	10.4	10.8	11.2	
Private Industry	78.7	115.4	179.0	178.2	207.8	
Overseas	-	-	-	-	-	
Others	-	-	-	-	!	
Other Government Depts	13.3	12.0	13.9	13.8	16.4	
NERC	1.3	1.4	1.3	1.1	0.9	
GROSS TOTAL	137.4	173.5	224.9	251.5	287.9	
Receipts	6.6	8.3	8.9	11.9	12.2	
NET TOTAL	131.1	165.2	236.1	239.7	275.7	

Major Fields of Activity £millions – Full Economic Costs

	1977/78	1978/79	1979/80	1980/81	1981/82 P	1982/83
Microelectronics & its Applications	2.7	4.9	8.8	10.9	10.7	
New Products and Processes	1.5	8.3	19.2	21.9	24.7	
Technology Transfer	-	-	-	-	-	
Materials, Chemicals & Minerals*	10.7	11.5	15.0	15.9	17.0	
Civil Aeronautical Technology	19.2	15.5	18.7	23.8	25.6	
Information Technology**	4.7	5.2	6.1	7.1	7.0	
Energy Efficiency in Industry	-	-	-	-	-	
Textiles & Other Manufacturers+	2.0	2.6	3.2	3.3	3.1	
Mechanical & Electrical Engineering++	14.3	16.3	19.9	24.1	24.1	
Metrology & Standards	10.0	10.1	11.0	13.3	14.8	
Space Technology	34.7	34.2	37.2	44.1	58.7	
Concorde	24.7	20.5	20.8	8.3	0.4	
Rolls Royce	5.0	36.3	75.9	67.1	88.9	
REs Technical Services	8.2	8.2	9.3	11.8	12.8	
Other	-	-	-	-	!	
TOTAL	137.4	173.5	244.9	251.5	287.9	

Full Economic Costs comprise the Direct Vote Costs plus, where applicable, all the appropriate support and overhead costs incurred in carrying out the work. They are given in current prices for the year concerned.

* Prior to 1981/82, Chemicals & Minerals and Engineering Materials

** Prior to 1979/80, Computer, Systems and Electronics

+ Prior to 1981/82, Garment and Allied Industries and Chief Scientist' Requirements

++ Prior to 1981/82, Mechanical Engineering and Machine Tools, Ship and Marine Technology and Electrical Technology

There were other changes of Subject Area from 1977/78 to 1979/80

Analysis of Expenditure on Non-Frascati Work £millions Full Economic Costs

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural	11.1	11.6	14.0	18.2	20.9	
Universities	!	!	!	!	!	
Public Corporations*	-	-	-	-	-	
Research Associations	1.6	1.8	2.8	4.0	4.0	
Private Industry	0.3	0.5	3.1	5.2	6.8	
Overseas	-	-	-	-	-	
Others	2.4	2.8	3.4	4.1	4.2	
OGD's	-	-	-	-	-	
NERC	1.7	1.9	2.0	2.0	1.8	
GROSS TOTAL	17.1	18.7	25.3	33.5	37.9	
Receipts	6.6	8.3	8.9	11.9	12.2	
NET TOTAL	10.4	10.4	16.5	21.6	25.7	

See note on Full Economic Costs on Table 13d

* UKAEA

DEPARTMENT OF INDUSTRY *Table 13d*

Major Fields of Activity Non-Frascati Work £millions Full Economic Costs

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Microelectronics & its Applications	-	!	1.8	3.6	3.8	
New Products and Processes	-	-	-	-	-	
Technology Transfer	6.4	7.5	9.9	13.3	15.4	
Materials, Chemicals & Minerals*	1.8	2.1	2.5	2.7	3.2	
Civil Aeronautical Technology	-	-	-	-	-	
Information Technology**	0.1	0.3	0.7	0.5	1.3	
Energy Efficiency in Industry	0.5	0.5	1.2	1.4	1.3	
Textiles & Other Manufacturers+	-	-	-	-	-	
Mechanical & Electrical Engineering++	-	-	-	-	-	
Metrology & Standards	-	-	-	-	-	
Space Technology	-	-	-	-	-	
REs Technical Services	8.2	8.2	9.3	11.8	12.8	
Other	-	-	-	-	-	
TOTAL	17.1	18.6	25.3	33.5	37.9	

Full Economic Costs comprise the Direct Vote Costs plus, where applicable, all the appropriate support and overhead costs incurred in carrying out the work. They are given in current prices for the year concerned.

* Prior to 1981/82, Chemicals & Minerals and Engineering Materials

** Prior to 1979/80, Computer, Systems and Electronics

+ Prior to 1981/82, Garment and Allied Industries and Chief Scientist's Requirements

++ Prior to 1981/82, Mechanical Engineering and Machine Tools, Ship and Marine Technology and Electrical Technology

There were other changes of Subject Area from 1977/78 to 1979/80

NORTHERN IRELAND DEPARTMENTS

The largest proportion of research and development expenditure in Northern Ireland (£12.5 million out of the total of £16.4 million) is in the agriculture sector. Research and specialist scientific, advisory and diagnostic work is designed to develop methods which increase the efficiency of production of and improve the quality of food. R&D work in this area is also designed to minimise environmental disturbance while maximising agricultural benefits.

The balance is made up of minor expenditure on roads, water and improvement of the environment plus a more substantial amount, £2.8 million, in the field of industrial production and technology.

NORTHERN IRELAND DEPARTMENTS *Table 14a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural	6.7	7.2	9.7	12.2	13.3	13.8
Universities	0.1	0.1	0.1	!		
Public Corporations	-	-	-	-		
Research Associations	!	0.1	0.1	!		
Private Industry	-	-	!	-		
Overseas	-	-	-	-		
Others						
Research Councils	0.1	0.1	0.2			
Other Government Depts	!	-	-	0.1	0.2	0.3
Others	0.6	1.2	1.5	2.6	3.7	3.3
TOTALS						
Gross	7.6	8.7	11.6	15.1	17.2	13.4
Net	7.1	8.0	11.0	14.5	16.4	16.5

OVERSEAS DEVELOPMENT ADMINISTRATION (ODA)

ODA funds R&D projects as part of its bilateral aid programme to individual developing countries. In addition ODA funds projects at home or overseas, which are not appropriate to funding from other bilateral aid funds, each of which is expected to benefit several developing countries rather than one.

The main purpose is to sponsor and to support a programme of research aimed at gathering new knowledge and evolving new techniques directly related to the needs of developing countries. The emphasis is on research likely to be of practical use in a reasonable period of time, and special priority is given to R&D of direct relevance to the poorer sectors of the poorer countries with particular reference to the development of the rural sector.

OVERSEAS DEVELOPMENT ADMINISTRATION *Table 15a*
Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural+	3.9	4.7	6.0	3.2	3.7	
Universities*	4.0	4.0	4.9	3.6	N/A	
Public Corporations	-	-	-	-		
Research Associations	-	-	-	-		
Private Industry	-	-	-	-		
Overseas $	2.2	2.5	2.3	4.3		
Others @	2.0	2.3	2.5	7.8		
NET TOTAL	12.1	13.4	15.6	18.9	18.8	22.4

+ UK Establishments including institutions of ODA, other Government Departments, and others
* Universities and Similar Institutions
$ Support to International Centres
@ Aid to Particular Countries

OVERSEAS DEVELOPMENTS ADMINISTRATION *Table 15b*
Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Exploration and utilization of the Earth and its Atmosphere		n/a		1.3	1.3	1.4
Planning of Human Environment				2.2	2.0	3.4
Human Health and Environment				1.6	1.6	1.7
Production, Distribution and Rational use of Energy				0.2	0.4	0.4
Promotion of Agricultural Production and Technology				11.0	11.0	12.7
Promotion of Industrial Productivity and Technology				1.3	1.3	1.5
Social Studies				1.2	1.2	1.3
TOTALS				18.9	18.8	22.4

Scottish Home and Health Department (SHHD)

The Chief Scientist's Organisation (CSO) of the Health side of SHHD funds long term research units, major research programmes and shorter-term projects through grants to universities and other institutions. The majority of the shorter-term grants are awarded in response to spontaneous applications and represent the bulk of the funding. The long-term programmes have mostly arisen as the result of key initiatives previously identified by the CSO. The broad fields of research currently supported are biomedical, health service, equipment for the disabled and other scientific and medical equipment. As far as the Home side of the SHHD is concerned, the research covers crime and allied social problems, the criminal justice process and the treatment of offenders.

Department of Agriculture and Fisheries for Scotland (DAFS)

The agricultural R&D undertaken by the Scottish Agricultural Research Institutes and Scottish Agriculture Colleges for the DAFS includes basic research to gain new knowledge and understanding, applied research aimed at improving and devising new techniques and systems, and development work aimed at exploiting the use of research findings in the agricultural, horticultural and food industries.

DAF's R&D undertaken by Agricultural Scientific Services arises almost entirely from its statutory and regulatory functions, and is mainly concerned with crops, but also includes work on pests, pest control and pesticides. The Royal Botanic Garden's R&D work is almost exclusively basic research in plant taxonomy, and is closely interwoven with other activities involved in running gardens of scientific/amenity interest and in providing training schemes for horticultural students.

A large part of the Fisheries R&D is to fulfil statutory responsibilities, and to aid the formulation of policy and the provision of advice to the administration. Examples are the annual assessment of fish stocks for the setting of catch limits and fishing quotas, the licensing and control of pollution and the diagnosis of notifiable diseases of farmed fish.

Scottish Economic Planning Department

The research programme of the Scottish Economic Planning Department relates to industrial and economic development in Scotland.

Scottish Development Department

The objectives of the Scottish Development Department's research–which relates to housing, planning, transport and air pollution–are to provide information on issues or developments particular to Scotland, which are not dealt with in the larger research programmes of UK departments. The research is of an applied nature and focusses on the specific policies and actions which have been taken or are contemplated by the Department.

Scottish Education Department

Two separate research programmes are administered by the Scottish Education Department, the objectives of which are (1) to encourage research into all fields of education so as to maximise the effectiveness of education in Scotland (2) to promote the effective and efficient use of social work services by examining areas of policy and practice of particular significance.

SCOTTISH DEPARTMENTS *Table 16a*

Analysis of Sector Carrying out the Work (1) £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural	5.9	6.5	7.1	9.1	9.9	10.9
SARI (2)	10.0	11.6	12.5	15.4	18.4	20.0
SAC (3)	3.8	3.9	4.8	6.0	6.2	5.8
Universities	1.7	1.9	2.5	3.1	2.2	2.5
Public Corporations	-	!	!	0.1	-	-
Research Associations	-	-	-	!	!	!
Private Industry (including consultants)	!	!	!	-	!	0.1
Overseas	-	-	-	-	-	-
Others (4)	1.0	1.2	1.6	2.0	1.6	1.7
TOTAL	22.5	25.1	28.5	35.7	38.4	41.0

(1) A slightly different definition of R&D expenditure has been used in Tables 16(a) and 16(b)
(2) Scottish Agriculture Research Institutes
(3) Scottish Agricultural Colleges
(4) Includes, for example, Health Boards

Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83 E
Scottish Office						
Internal Manpower Planning of Human Environment	0.2	0.1	0.2	0.4	0.3	0.3
Human Health and Environment	0.1	0.1	0.2	0.3	0.3	0.3
Social Studies	0.6	0.6	0.5	0.6	0.8	0.9
SHHD						
Health CSO	2.2	2.3	3.2	3.8	2.4	2.5
Home Affairs	!	!	0.1	0.1	0.1	0.2
DAFS						
Animals	7.0	8.6	9.4	11.9	13.5	13.7
Agriculture Crops and Forage (2)	4.2	4.4	4.9	5.7	7.7	9.2
Horticulture	1.8	2.0	2.5	2.8	2.4	2.0
Engineering	1.0	1.1	1.3	1.9	2.2	2.3
Fisheries	4.2	4.7	5.5	6.8	7.4	8.2
SEPD						
Social Sciences and Humanities	!	!	!	!	!	0.1
SDD						
Housing	!	!	0.1	0.1	0.1	0.1
Physical Planning	!	0.1	0.1	0.1	!	!
North Sea Oil Planning	!	!	!	!	!	!
Water and Waste	!	0.1	0.1	0.1	0.1	0.1
Air Pollution	0.1	!	0.1	0.1	!	!
Miscellaneous (including Transport and Local Government)	!	!	!	!	!	!
SED						
Education Research	n/a	n/a	n/a	2.2	2.3	2.4
Social Work Research	0.1	0.1	0.1	0.1	0.2	0.2
TOTAL (1)	21.6	24.5	28.1	37.0	39.9	42.4

(1) Totals from 1977/78 to 1979/80 exclude Education Research

(2) Includes the cost of R&D work on Soil and the Science and Soil Survey

E–Estimates

DEPARTMENT OF TRANSPORT (DTp)

The DTp's research programme relates to its responsibilities for land transport systems, all of which have a technology base requiring scientific and technical expertise.

The DTp is concerned that people and goods can be moved in an increasingly cost-efficient manner by rail or road without sacrificing safety and comfort. Such responsibilities lead to the DTp having an interest in, inter alia, improvements in the design and maintenance of highways, bridges, railways and harbours; in vehicle developments which reduce atmospheric pollution, noise and energy consumption; in traffic control systems which safely increase the capacity of the infra-structure (thereby reducing demand for capital investment); in the planning and operation of public transport to meet need cost-effectively; and in measures which enhance the safety of all road users.

Much of what DTp does for its own purpose is relevant to the needs of local authorities and the construction and transport industries. Although their interests are not a primary consideration, where they interact with DTp's own interests (eg traffic signals regulations) they are taken into account in planning the programme by the appropriate policy customers.

The output of research in the social sciences field (for example, into the relationship between public transport fares, service levels and patronage) is mutually beneficial to DTp (on issues of subsidy policy), to local authority transport planners, and to operators. United Kingdom membership of the European Community has brought with it the requirement to evaluate proposed EC directives and regulations to assist in international negotiations. This is particularly true with regard to vehicle air and noise pollution and safety features; in this respect DTp works closely with British industry in order that a balanced view of the national interest can be taken.

DEPARTMENT OF TRANSPORT *Table 17a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79 S	1979/80 S	1980/81	1981/82 F	1982/83
Intra-mural	8.1G	8.3	7.9	9.1	15.0	
Universities	0.9	1.5	1.9	1.9	1.8	
Public Corporations	N/S/A	N/S/A	3.9*	5.2*	5.1*	
Research Associations	0.5	0.6	0.5	0.4	0.2	
Private Industry	4.6@	6.4@	1.2	1.5	2.4	
Overseas	N/S/A	N/S/A	N/S/A	N/S/A	N/S/A	
Others						
Other Government Depts	0.3	0.6	0.6	0.6	0.2	
Consultants	@	@	1.6	1.9	0.8	
Local Authorities	0.2	0.2	0.3	0.6	0.2	
Research Councils	!	!	!	-	!	
Others	0.1	0.2	0.1	-	!	
TOTAL	14.6G	18.0	17.8	21.1	25.7	

N/S/A not separately available; * British Rail and Longon Transport
@ figure includes British Rail and Consultants
P Provisional; S September 1979 prices; G Gross Expenditure
F Figures for 1981/82 Intramural research on Full Economic Cost Basis

DEPARTMENT OF TRANSPORT
Major Fields of Activity

Table 17b

£millions (Cash) Full Economic Cost Basis

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Highways	See table 17c				10.8	
Safety					4.4	
Transport System excl BR and LT					3.7	
British Rail					3.5	
London Transport					1.6	
Repayment Work					1.7	
TOTALS						
Gross					27.7	
Net					23.9	

Table 17b refers to Frascati R&D

DEPARTMENT OF TRANSPORT

Table 17c

Major Fields of Activity

£millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Transport Systems	5.7	6.5	6.3	8.3 @	see Table 17b	
Highways	7.8T	11.3H	11.0H	9.9 @		
Safety				3.0 @		
Special Programmes	0.8	1.4	1.5	-		
Estimated Common Service Costs +	0.4$	0.7	0.5	0.3		
New buildings & Major Works Services	0.1	0.2	!	1.3		
GROSS TOTAL	1.5	20.1	19.3	24.0		
Receipts	N/A	1.2	1.0	1.2		
NET TOTAL	N/A	18.8	18.2	22.8		

Table 17c has not been checked against the Frascati definition of R&D
@ Net Figures $ Excludes DGR staff on Transport Research
+ Prior to 1981/82: HQ Staff Concerned with Research
T Highways and Road Safety H Highways, Traffic and Road Safety

SECTION II

DEPARTMENT OF EMPLOYMENT (DEmp)

Although a certain amount of research work is undertaken by DEmp's professional staff, most of its research needs are met by research projects commissioned externally, through commercial, social and academic research organisations.

The scope of research projects can vary considerably. Some are designed to increase the DEmp's understanding of basic problems in order to provide background material for the formation of policy, others to build up specific knowledge required for the implementation of policy, and others are concerned with evaluating, monitoring and examining the impact of particular measures.

The areas of research covered by DEmp relate to its main areas of policy interest, namely general manpower issues, including issues specific to particular groups of workers, industrial relations and pay and incomes.

Manpower issues cover employment market studies and look at the effects and consequences of unemployment, and at measures to alleviate unemployment and generate new employment. More specifically the DEmp looks at employment issues as they effect specific groups of workers such as women, ethnic minotiries and young people.

Industrial relations research is concentrated on increasing understanding of industrial relations practices and on the working of labour legislation. Pay and incomes research is aimed at obtaining more understanding of the composition and movement of earnings, of different payment systems and of the effects of factors such as productivity and reductions of working time.

MANPOWER SERVICES COMMISSION (MSC)

The objectives of the MSC's research programme are to increase knowledge of the labour market and the behaviour of the employers and individuals for whom the MSC's services are intended; to improve understanding of labour market needs and the objectives the Commission sets; to identify and assess the effect of existing policies on the labour market; to improve the planning and organisation of services at local or national levels; or to help the MSC develop new or revised policies.

DEPARTMENT OF EMPLOYMENT

Table 18.1a

Analysis of Sector Carrying out the Work

£millions

	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Intra-mural	not available			0.5	0.9	0.8
Universities	0.6	0.7	0.8	2.8	0.2	0.2
Public Corporations					0.3+	0.2+
Research Associations					0.1	!
Private Industry					-	-
Overseas					-	-
Others					2.6*	3.0*
TOTALS	n/a	n/a	n/a	n/a	4.0	4.4

Figures after 1979/80 include the Manpower Services Commission
+ Includes Policy Studies Institute
* Includes Manchester Education Department

DEPARTMENT OF EMPLOYMENT

Table 18.1b

Major Field Activity

£millions

	1977/78	1978/79	1979/80	1980/81	1981/82 E	1982/83 E
Manpower Studies	0.1	0.2	0.4	0.4	0.4	
Careers Service	!	-	-	-	-	
Race Relations	!	0.1	-	-	-	
Industrial Relations	!	0.1	0.3	0.1	0.1	
Incomes (+ Pay after 1979)	!	0.1	0.1	!	0.1	
Job design and work organisation	0.1	0.1	0.1	!	-	
MRC (Industrial Psychology)	0.2	0.2	-	-	-	
Manpowers Services Commission	n/a	n/a	n/a	2.8	3.1	3.5
TOTAL (Excludes Iotra-Mural)	0.5	0.7	0.8	3.3	3.7	

Figures after 1979/80 include the Manpower Services Commission

HEALTH AND SAFETY COMMISSION (HSC)

The HSC and its Executive have a duty to advise, inform, encourage, inspect and regulate in order to bring about the best practicable levels of health and safety in occupational activities. Their research programme is an integral part of, and is wholly determined by, this practical task.

The objectives of the research therefore include –

a. establishing the factual basis for new or revised standards;
b. evaluating the hazards that may accompany the introduction of new technology and new materials by industry;
c. finding improved techniques to monitor and control known hazards;
d. developing forensic and other test methods for accident and incident investigations.

HEALTH AND SAFETY EXECUTIVE *Table 18.2a*

Analysis of Sector Carrying out the Work £millions

	1977/78 E	1978/79 E	1979/80 E	1980/81 E	1981/82	1982/83
Intra-mural	Not available				5.1	
Universities					0.6	
Public Corporations					-	
Research Associations*					0.3	
Private Industry					0.1	
Overseas					!	
Others+					0.9	
TOTALS	5.3	5.7	6.1	6.5	7.0	

* And Government Research Establishments
+ Hospital Medical Schools, MRC units
E Estimates based on 7 per cent per annum increase to the 1981/82 figures

HEALTH AND SAFETY EXECUTIVE *Table 18.2b*

Major Fields of Activity £millions

	1977/78 E	1978/79 E	1979/80 E	1980/81 E	1981/82	1982/83
Explosions, Fire, Explosives, Major Hazards					1.6	
Electrical Hazards					0.3	
Future Nuclear Reactor Systems					0.1	
Engineering Hazards					1.0	
Environment Hazards					2.5	
Abnormal Body Constituents plus Occupational Medicine					1.3	
Instrumentation R&D					0.2	
Agricultural Hazards					0.1	
TOTALS	5.3	5.7	6.1	6.5	7.0	

E Estimates based on 7 per cent increase per annum to the 1981/82 figure

DEPARTMENT OF TRADE (DOT)

The objectives of DOT's research programmes are to support the discharge of the Department's functions in relation to marine safety and the welfare of seafarers; the reduction of aircraft noise; consumer safety; and legal metrology.

DEPARTMENT OF TRADE *Table 18.3a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82 E	1982/83 E
Intra-mural	0.1	0.1	-	0.1	0.1	0.1
Universities	!	!	!	!		
Public Corporation	-	-	0.4	!		
Research Association	0.4	-	-	0.2		
Private Industry	!	!	0.6	0.5		
Overseas	-	-	0.1	0.1		
Other Government Departments	!	0.1	1.3	1.3	1.7	1.7
Others	0.1	0.1	0.2	0.2	N/A	N/A
TOTALS	0.6	0.3	2.4	2.4	2.6	3.1

Note that the Department of Trade was incorporated into the Department of Trade and Industry in June 1983

DEPARTMENT OF TRADE *Table 18.3b*

Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82 E	1982/83 E
Consumer Protection	0.1	0.2	0.2	0.4	0.5	0.5
Consumer Affairs/Standards	0.1	0.1	0.1	0.1	0.1	0.2
Marine/Shipping Services*	-	-	1.7	1.8	2.0	2.3
Civil Aviation*	-	-	0.4	!	0.1	0.1
Other Services	0.4	!	-	-	-	-
TOTALS	0.6	0.3	2.4	2.4	2.6	3.1

Note that the Department of Trade was incorporated into the Department of Trade and Industry in June 1983. The Research Fields indicated thus * became the responsibility of the Department of Transport.

OTHER PROGRAMMES

The objectives of the Forestry Commission R&D programmes are to increase knowledge on the practice of forestry in Britain, to improve understanding of the way in which management influences the quantity and quality both of wood-produced and of environmental benefits, and to develop working methods improving the effectiveness of men and machines in ways compatible with the environment.

The Ordnance Survey (OS) undertakes neither 'basic research' nor 'applied research' but does engage in 'experimental development' (Frascati manual definitions), with the following objectives–

a. To develop and introduce into service more efficient and cost effective techniques, equipment and systems for the production and dissemination of topographic data in forms best suited to meet customer needs.
b. To encourage British Universities and research institutions to undertake projects.
c. To monitor developments in all relevant technologies.
d. To monitor work carried out in the UK and internationally and to collaborate in joint projects where appropriate.
e. To participate in international scientific activities and to make a proper contribution to international projects.

[The research programmes of the other Departments included in this section support the objectives of those organisations]

OTHER PROGRAMMES *Table 18.4a*

Analysis of Sector Carrying out the Work £millions

	1977/78	1978/79	1979/80	1980/81	1981/82 E	1982/83 E
Intra-mural	3.0	3.2	5.7	7.2	7.3	
Universities	1.0	0.9	1.0	0.9	!	
Public Corporations						
Research Associations						
Private Industry	0.1	0.1	!	0.3	0.1	
Overseas	!	!	!	!		
Others	0.7	0.6	0.7	0.6	1.6	
Other Government Depts	0.1	0.1	0.1	0.2	0.2	
TOTAL GROSS	4.9	5.0	6.9	9.1	9.3	

Source: Department of Industry

OTHER PROGRAMMES *Table 18.4b*

Major Fields of Activity £millions

	1977/78	1978/79	1979/80	1980/81	1981/82 E	1982/83 E
British Library	1.4	1.1	1.1	1.2	1.3	1.5
Customs and Excise	!	!	!	0.1	0.1	!
FCO	0.1	0.1	0.1	0.1	0.1	0.1
Forestry Commission	2.1	2.4	2.9	3.5	4.0	n/a
HM Treasury	0.4	0.5	0.5	0.2	0.2	0.2
Office of Fair Trading	!	!	!	0.1	0.1	0.1
OPCS	0.7	0.8	1.9	3.3	3.1	3.1
Ordnance Survey	0.1	!	0.3	0.5	0.4	0.8
Public Records Office	!	!	-	-	-	-
TOTALS	4.9	4.9	6.9	9.0	9.3	n/a

Source: Department of Industry

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